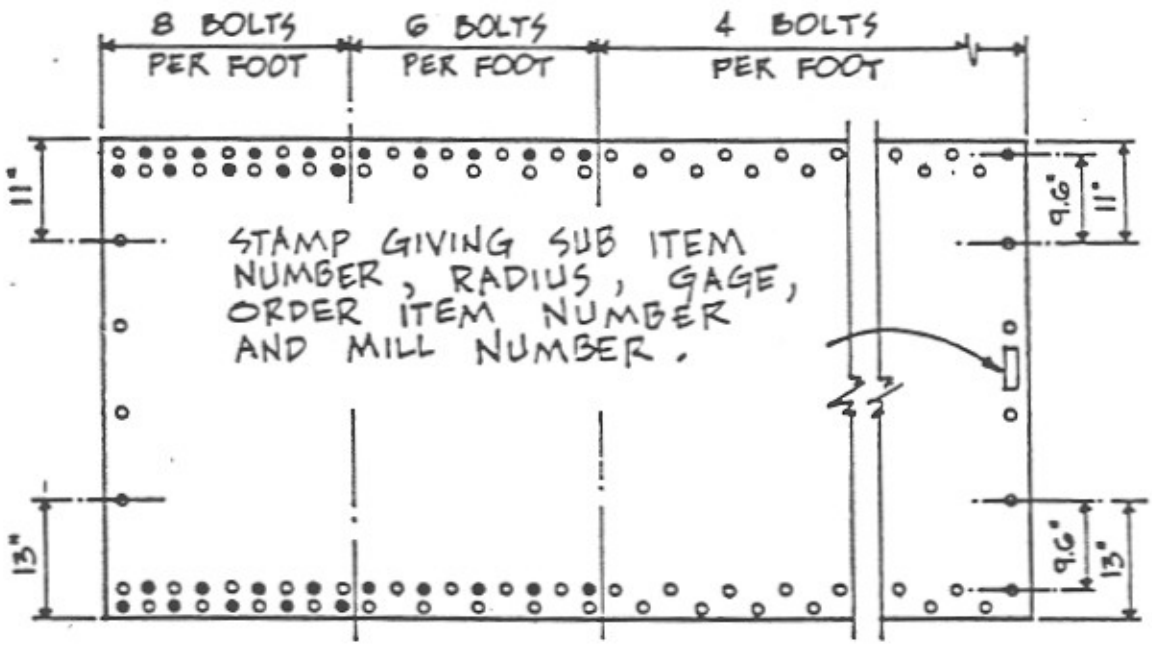
CHAPTER 17

MULTI-PLATE PIPE

Description of Material:

Plates: The plates for MULTI-PLATE pipe are furnished in two lengths, nominally 10 feet and 12 feet long. In special instances, one or more 6-foot-long plate' may be furnished. Plate widths are about 3 feet, 4 feet, 5 feet. 6 feet and 7 feet. The 3-foot-wide plate has 4 holes across each end; the 4 foot has 6 holes; the 5 foot has 7 holes; the 6 foot has 8 holes; and the 7-foot plate has 9 holes.

Each plate is identified by numbers stamped into the inside crest of an end corrugation near the middle of the plate except plates for special ends have these numbers stamped near each corner before cutting. The first three (3) numbers are the sub item number. The second three (3) numbers are the plate radius in inches. The seventh number is the plate gage number, with the exception that "0" is for 10 gage and "2" is for 12 gage and a blank designates thickness greater than I gage. The eighth number is the order item number. The last four (4) numbers are the mill order number (See Figure 1).



INSIDE VIEW

o Standard holes

• Added holes for 6- and 8-bolt construction

FIGURE 1

If the structure is to be erected with skewed or sloped ends, look for embossed identification marks on the inside of each cut plate. Plates to be used in an elbow section will be identified with similar embossed numbers on the inside of each cut and welded plate. These numbers will correspond to plates as marked on the cut end or elbow layout drawing.

Bolts: For convenience, MULTI-PLATE bolt and nut containers are stenciled as follows:

Size
3/4"x 1-1/4"
3/4"x 1-1/2"
3/4"x 1-3/4"
3/4"x 2'
3/4"x 3'
Nuts

Each structure will have six (6) 3-inch-long service bolts to use as assembly tools to temporarily draw plates together where needed. They should not remain in the structure. The required number of bolts for a structure rarely amounts to full keg lots or all sizes. The carton containing partial amounts of one size will also have the required 3-inch bolts. This carton will be remarked accordingly.

Bolts are furnished in two lengths. the longer length for three (3) thicknesses of metal. Length of bolts furnished for various plate thickness is as follows:

Galvanized Plates:

Plate Gage	(Thickness)	Bolt Lengths
1 Gage	(.280")	1-1/2" and 2"
3 Gage	(.249")	1-1/2" and 2"
5 Gage	(.218")	1-1/2" and 1-3/4"
7 Gage	(.188")	1-1/2" and 1-3/4"
8 Gage	(.168")	1-1/4" and 1-1/2"
10 Gage	(.138")	1-1/4" and 1-1/2"
12 Gage	(.109")	1-1/4" and 1-1/2"

Asphalt Coated Plates:

Plate Gage	(Thickness)	Bolt Lengths
1 Gage	(.280")	1-3/4" and 2"
3 Gage	(.249")	1-3/4" and 2"
5 Gage	(.218")	1-3/4" and 2"
7 Gage	(.188")	1-3/4" and 2"
8 Gage	(.168")	1-1/2" and 1-3/4"
10 Gage	(.138")	1-1/2" and 1-3/4"
12 Gage	(.109")	1-1/2" and 1-3/4"

The longer of the two (2) bolt lengths go in the corners of the plates where three (3) thicknesses of metal overlap and in the hole next to the corner in the longitudinal seam. The shorter of the two (2) bolts go where only two (2) thicknesses of metal overlap (See Figure 2).

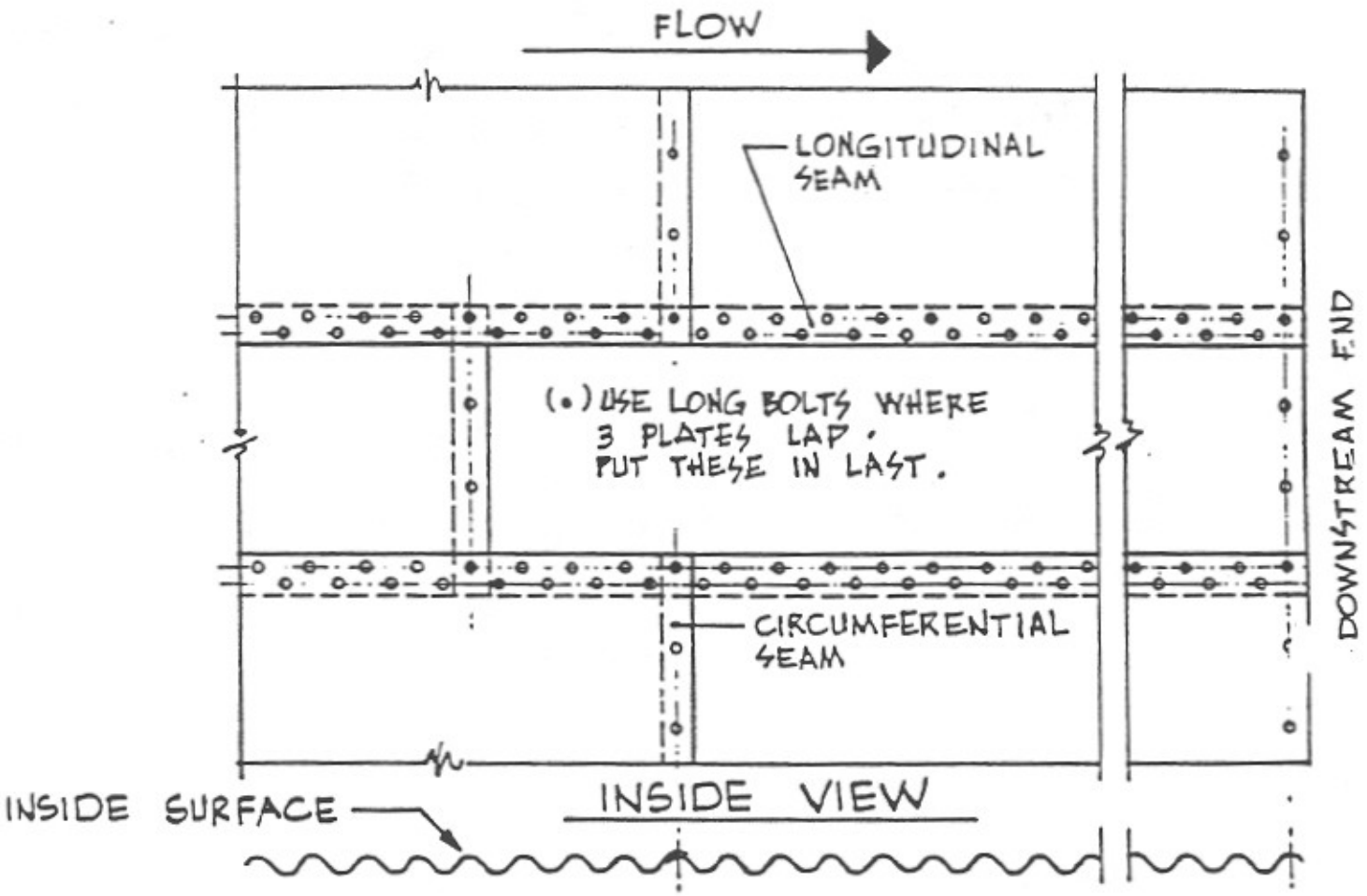


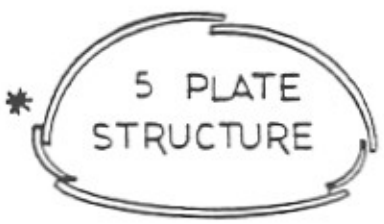
Figure 2

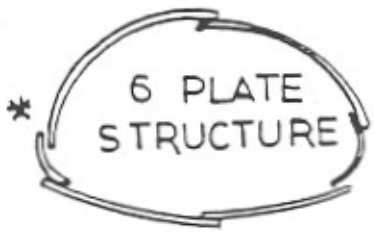
Plate Identification and Location: The various widths of plates are located in the barrel in accordance with the plate layout drawings. The numbers appearing in the barrel area or on the plates (numbers 4, 6, 7, 8 or 9) are the number of bolt holes across the end of each plate. The line layout and/or plate layout shows total 10-foot and 12-foot-long rings making up the structure.

Beginning and ending rings are shown for square end structures and these contain combinations of 10-foot and 12-foot,ririgs required to obtain proper plate stagger. Special plates in cut end structures are shown on the plate layout together with necessary 10-foot and 12-foot long plates required to obtain proper seam stagger in the barrel. Intermediate barrel rings contain plates all the same length. For cut plates and elbow cut and welded plates, numbers appear on the plate layout corresponding to the embossed numbers on the plates themselves.

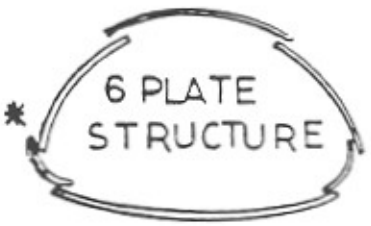
TYPICAL BARREL END VIEWS

LOOKING DOWNSTREAM

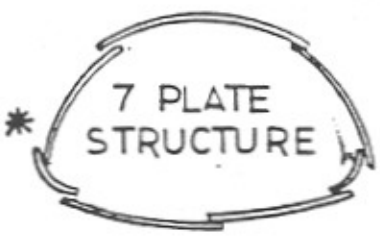


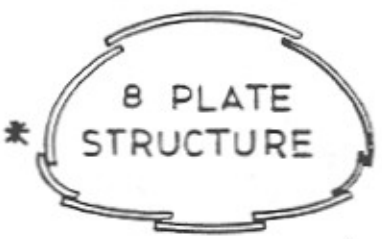


(2 BOTTOM PLATES)

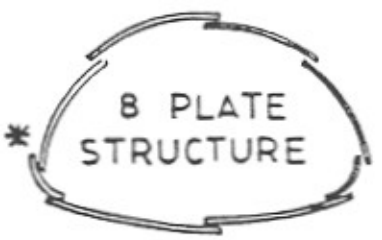


(1 BOTTOM PLATE)

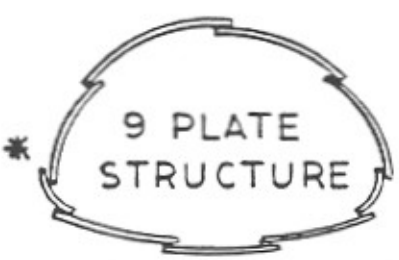


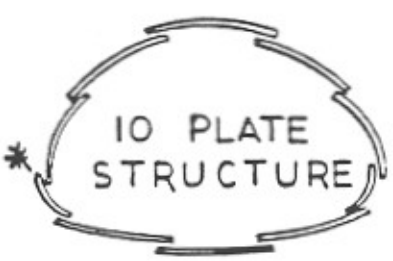


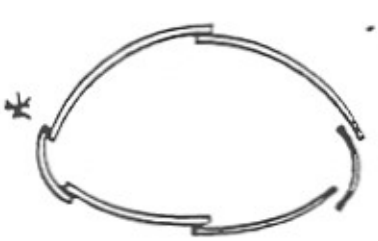
(3 BOTTOM PLATES)



(2 BOTTOM PLATES)





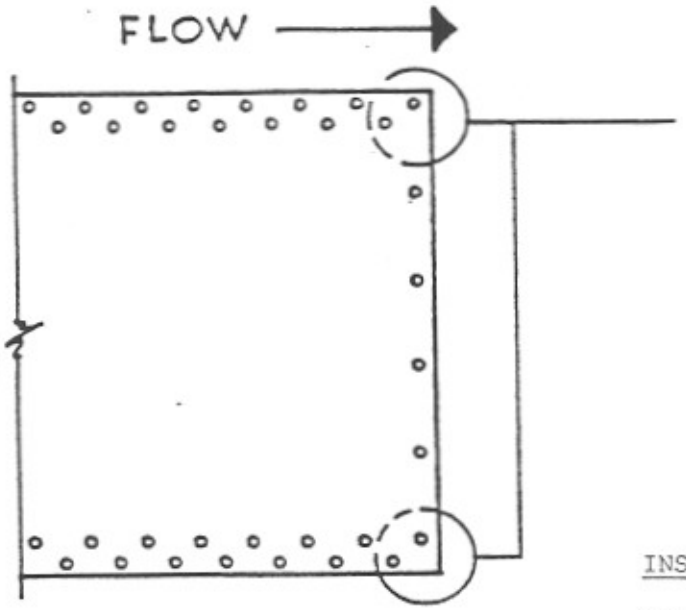


SHINGLE CONSTRUCTION

WHERE INFILTRATION OF FINE GRAINED BACKFILL MATERIAL MAY OCCUR, SHINGLE CONSTRUCTION MUST BE USED. ADDITIONALLY, FILTER FABRIC MUST BE USED OVER THIS SEAM *

Pipe-Arch Assembly: The pipe-arch is assembled in three (3) stages: 1) bottom; 2) corners; and 3) top.

1) Bottom (invert) plates are assembled by laying the first bottom plate at the outlet end, then placing each succeeding plate in the longitudinal row so it laps one (1) corrugation of the preceding plate (See Figure 2). Position invert plates accurately with a stringline before tightening bolts.



IMPORTANT:

Note the two (2) corner bolt holes are different. One (1) is Close to the plate edge, the other is set in from the plate edge. When beginning construction, the corner bolt hole pattern must match the pattern shown in detail "A" on the plate layout drawing.

INSIDE VIEW

FIGURE 3

2) After several invert plates have been laid down, aligned, and bolts tightened, start again at the outlet end and attach corner plates to each side. These corner plates may lap either inside or outside the invert plates (see typical barrel end views on next sheet). Also, each additional corner plate laps over the preceding plate by one (1) corrugation.

3) Finally, the top plates are put in place. The upper half of the pipe-arch is assembled with each plate lapping outside the plate immediately below it except at top of corner plate. (See Figure 4 and typical end views, sheet 5.) Extend each *row only* far enough to support the next row of plates above to a place where one (1) final plate can be added to complete the ring. Each additional top plate laps over the previous plate by one (1) corrugation.

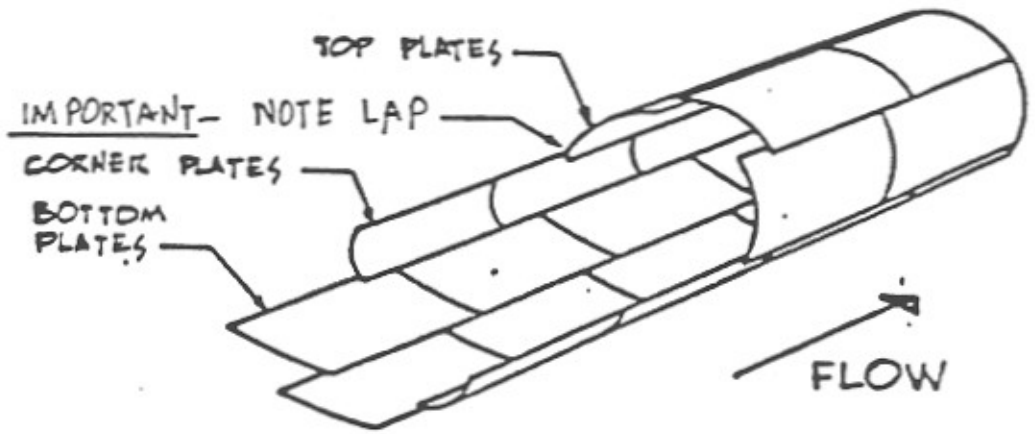


FIGURE 4

Bolting: To facilitate alignment, initial assembly should be done with a minimum number of bolts. Insert sufficient bolts in each seam to hold plates in position, but do not tighten the nuts. thus leaving the plate free to move slightly to help in matching the remaining bolt holes. Bolting the circumferential seam is best done by first placing bolts near the middle of the plate. About three (3) rings behind plate assembly, insert remaining bolts, using pins or pry bar to align holes. After all bolts are in place, tighten nuts. Note, aligning of bolt holes is done easier when bolts are loose while drifting of holes is best done with adjacent bolts tight.

Sometimes it is desirable to insert and tighten all bottom plate bolts as the bottom is assembled. If this is done, be certain plates are properly aligned before tightening bolts. Always assemble corner and top plates with as few bolts as possible while initially assembling the structure.

Recommended range for bolt torque is between 100 and 300 foot-pounds. Maintain a balanced progression of tightening with respect to the axis of the structure to prevent a spiraling tendency.